

# Regarding “Radiation Exposure in Posterior Lumbar Fusion: A Comparison of CT Image-Guided Navigation, Robotic Assistance, and Intraoperative Fluoroscopy” by Wang et al

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The study published by Wang et al is highly interesting in our opinion and it highlights a crucial aspect of spinal surgery in terms of patient safety.<sup>1</sup> Furthermore, it is beyond all doubt essential to assess the radiation exposure of conventional fluoroscopy-guided surgery to robotic navigational guidance and intraoperative computed tomography (CT) image-guided navigation. As stated by Wang et al and shown by various authors, the application of these techniques yields improved accuracy of pedicle screw positioning.<sup>1</sup> However, there are some aspects of this study that need to be discussed, and we would like to compare our findings on radiation exposure in intraoperative computed tomography (iCT) versus fluoroscopy-assisted surgery to this study.<sup>2</sup>

The authors reveal that in the open surgery fluoroscopy-guided subgroup  $1.32 \pm 0.47$  levels were fused, and they stated that the fluoroscopy time of 3 surgeons who performed the majority of these cases ranged from 12.27 to 24.24 seconds per procedure.<sup>1</sup> In our open surgery fluoroscopy-guided subgroup  $1.5 \pm 0.86$  levels were fused per procedure, and we found a mean fluoroscopy time of  $11.02 \pm 5.18$  seconds per fused level. These findings are very likely due to circumstance that generally only 1 or 2 lateral and 1 anteroposterior images are taken per pedicular screw.

Unfortunately, the “radiation exposure” is not clearly defined, but considering the usage of the unit mGy it is likely to be the absorbed dose. Unlike the dose area product (DAP) for fluoroscopy and dose length product (DLP) for CT scans, the absorbed dose does not account for the irradiated area or length, respectively.<sup>2</sup> Furthermore, in order to compare iCT and fluoroscopy radiation exposure we estimated the effective dose via calculations based on DAP and DLP. In our study, the mean effective dose for patients who underwent surgery with fluoroscopy was 0.316 mSv, which is relatively low compared to previous studies on radiation in both open and minimally

invasive transforaminal lumbar interbody fusion.<sup>2-5</sup> As reviewed by Hammad et al, the mean fluoroscopy time in literature ranges from 16.4 to 39 seconds per procedure.<sup>6</sup> Overall, a more precise definition regarding “radiation exposure” is required, and we would suggest to provide the effective dose data in order to improve comparability.

According to our data no substantial better outcome regarding complications, screw placement, or improvement of local profile was observed in the iCT group compared to the fluoroscopy group, while operation time and effective dose were significantly higher.<sup>2</sup>

In conclusion, we would like to highlight that radiation in open transforaminal lumbar interbody fusion can be further minimized, thereby increasing patient and personnel safety while maintaining excellent results.

## Editors' Note

The authors declined to respond to the Letter to the Editor.

## Declaration of Conflicting Interests

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

## Funding

The author(s) received no financial support for the research, authorship, and/or publication of this article.

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